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(54) **MOBILE TERMINAL FOR CHANGING  
DISPLAY MODE OF AN APPLICATION  
BASED ON A USER INPUT OPERATION AND  
OPERATION CONTROL METHOD  
THEREOF**

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**G06F 3/0488** (2013.01)

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(58) **Field of Classification Search**  
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USPC ..... 715/800  
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,684,969	A *	11/1997	Ishida	715/800
5,838,317	A *	11/1998	Bolnick et al.	715/764
6,300,947	B1 *	10/2001	Kanevsky	715/866
6,501,487	B1 *	12/2002	Taguchi	715/788
7,812,826	B2 *	10/2010	Ordning et al.	345/173
7,844,913	B2 *	11/2010	Amano et al.	715/769
7,949,954	B1 *	5/2011	Jezek, Jr.	715/800
7,992,103	B2 *	8/2011	Gusmorino et al.	715/835
8,464,177	B2 *	6/2013	Ben-Yoseph et al.	715/800
2005/0068290	A1 *	3/2005	Jaeger	345/156

(Continued)

FOREIGN PATENT DOCUMENTS

CN	101379461	A	3/2009
WO	WO 2006/020305	A2	2/2006

(Continued)

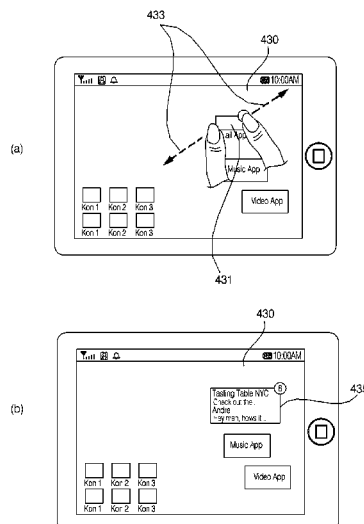
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(57) **ABSTRACT**

A method of controlling a mobile terminal including allowing, via a wireless communication unit on the mobile terminal, wirelessly communication with at least one other terminal; displaying, on a display of the mobile terminal, an application screen corresponding to an execution of an application on the mobile terminal; reducing, via a controller on the mobile terminal, a size of the application screen in response to a reduction input operation performed on the mobile terminal; determining, via the controller, if the application screen is reduced below a predetermined size; displaying, via the display, a widget corresponding to the application instead of the application screen on the display when the application screen is reduced below the predetermined size; and expanding, via the controller, the application screen back to its original size before the reduction input operation has been performed when the application screen is not reduced below the predetermined size.

**19 Claims, 18 Drawing Sheets**



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(56)

## References Cited

2012/0159402 A1\* 6/2012 Nurmi et al. .... 715/863

### U.S. PATENT DOCUMENTS

2006/0236264 A1\* 10/2006 Cain et al. .... 715/788  
2007/0152984 A1 7/2007 Ording et al.  
2008/0235602 A1\* 9/2008 Strauss et al. .... 715/762  
2009/0100361 A1 4/2009 Abello et al.  
2010/0313129 A1\* 12/2010 Hyman ..... 715/719  
2012/0046075 A1\* 2/2012 Griffin ..... 455/566

### FOREIGN PATENT DOCUMENTS

WO WO 2008/086056 A2 7/2008  
WO WO 2008/131417 A1 10/2008  
WO WO 2010/035180 A2 4/2010

\* cited by examiner

FIG. 1

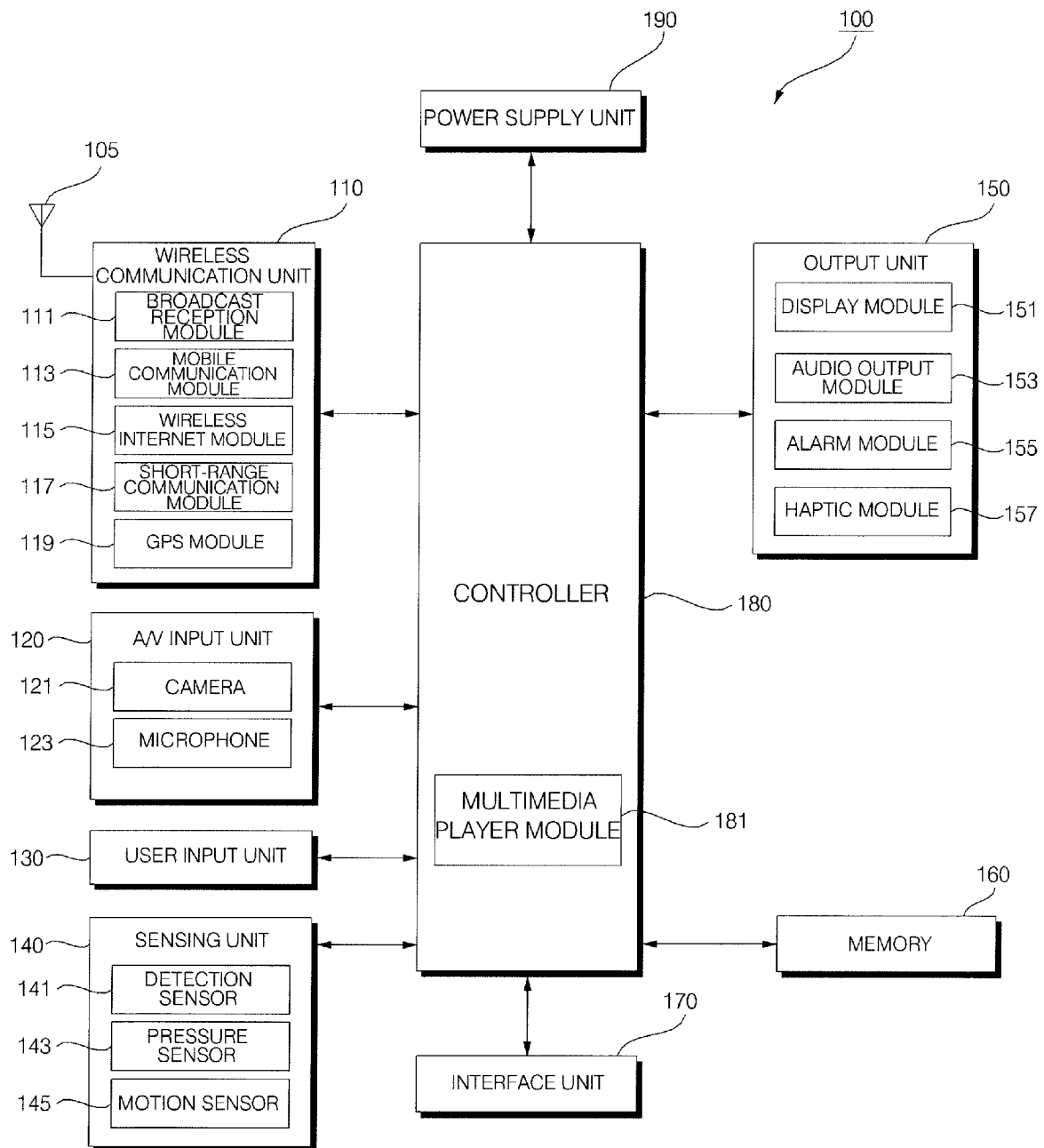
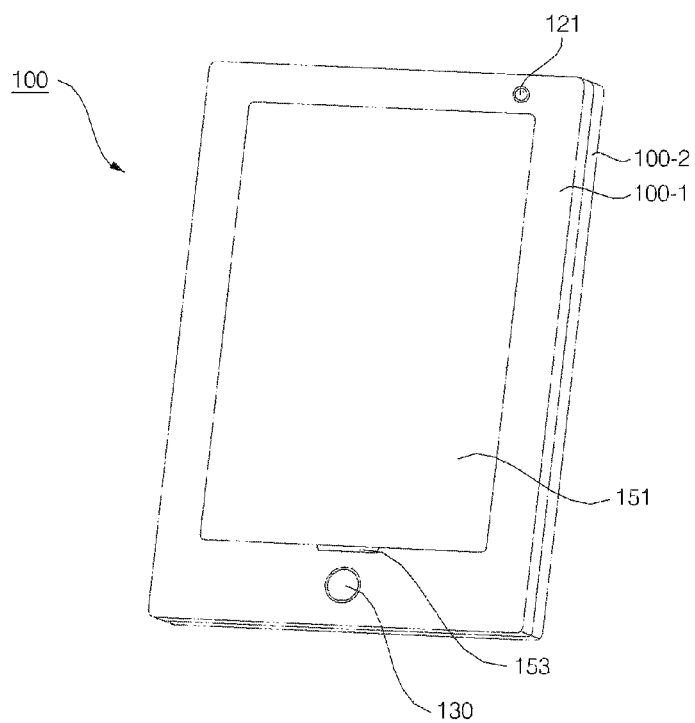
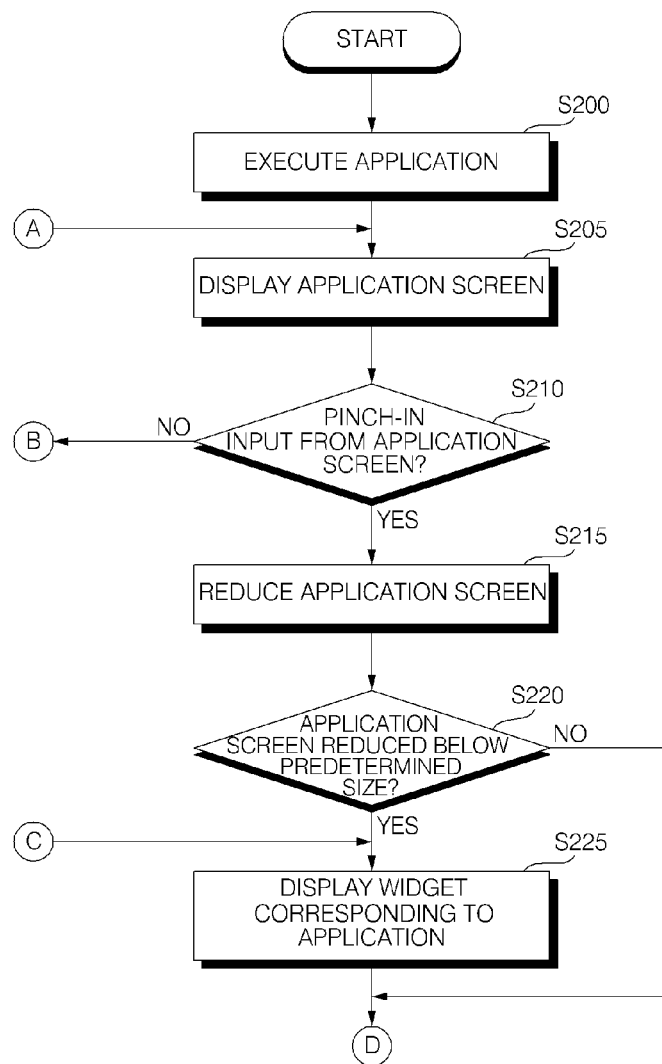
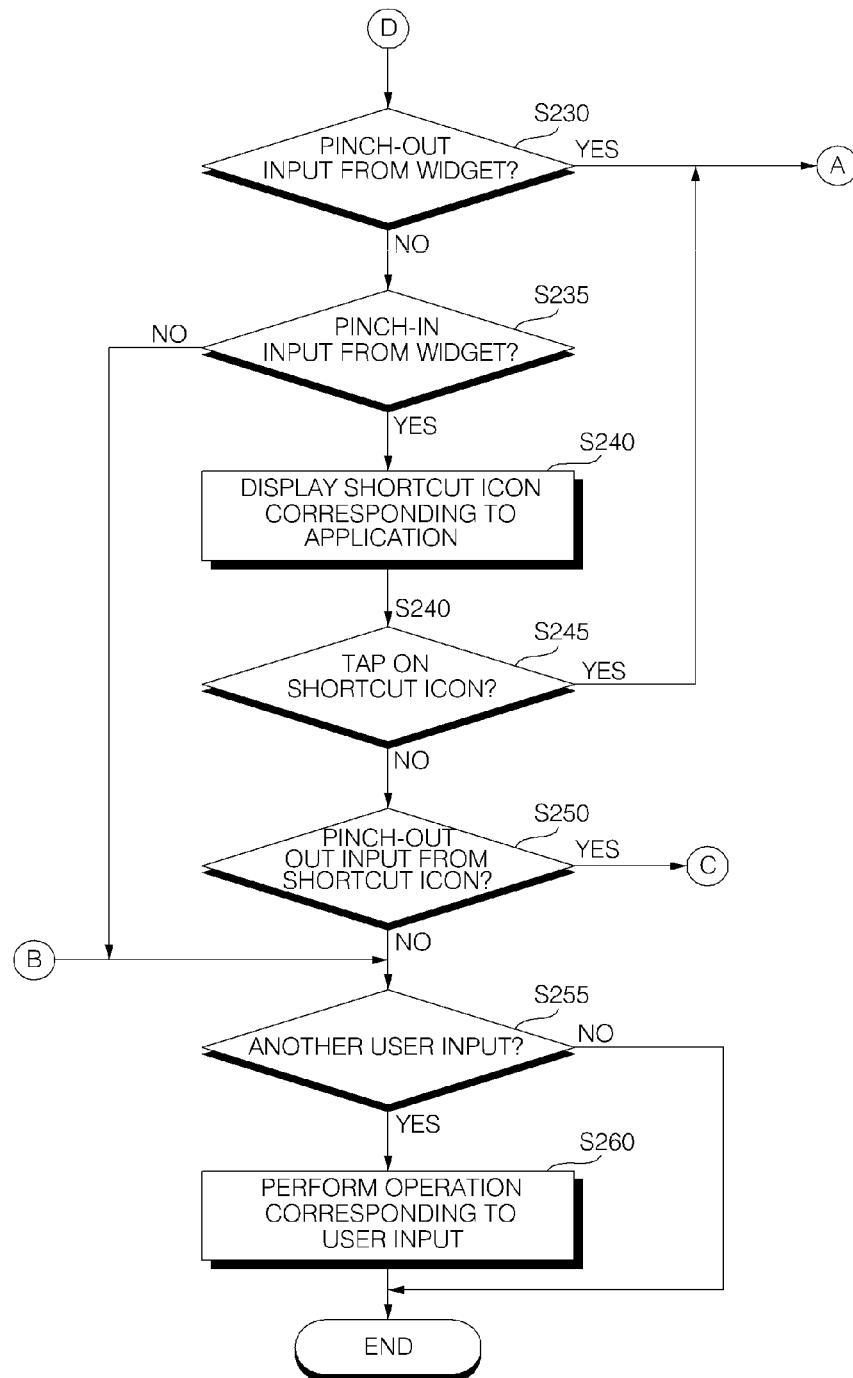


FIG. 2



**FIG. 3A**

**FIG. 3B**

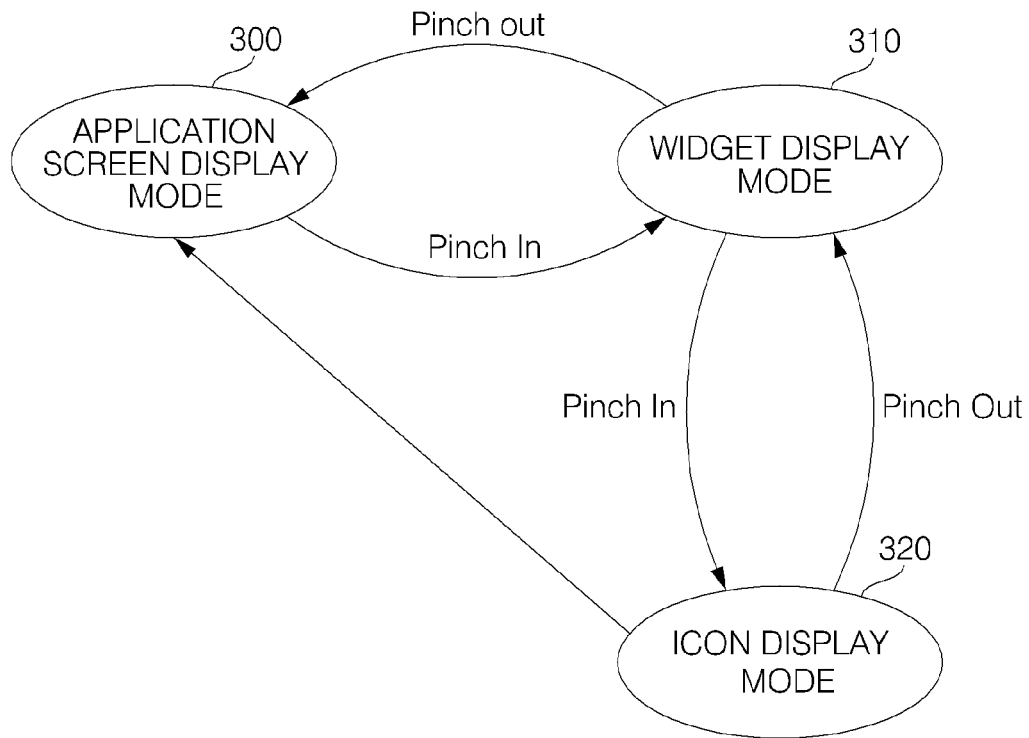
**FIG. 4**

FIG. 5

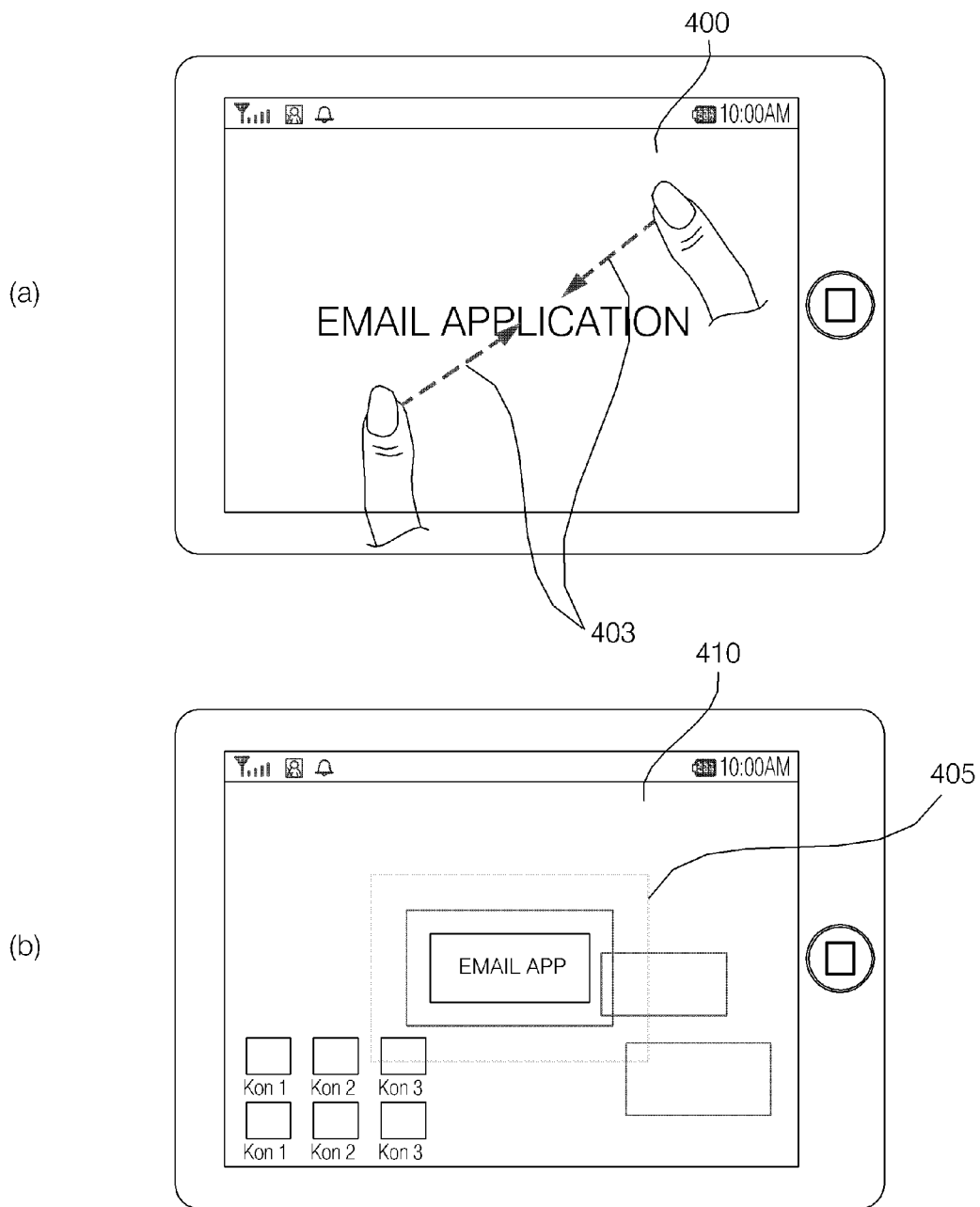




FIG. 6

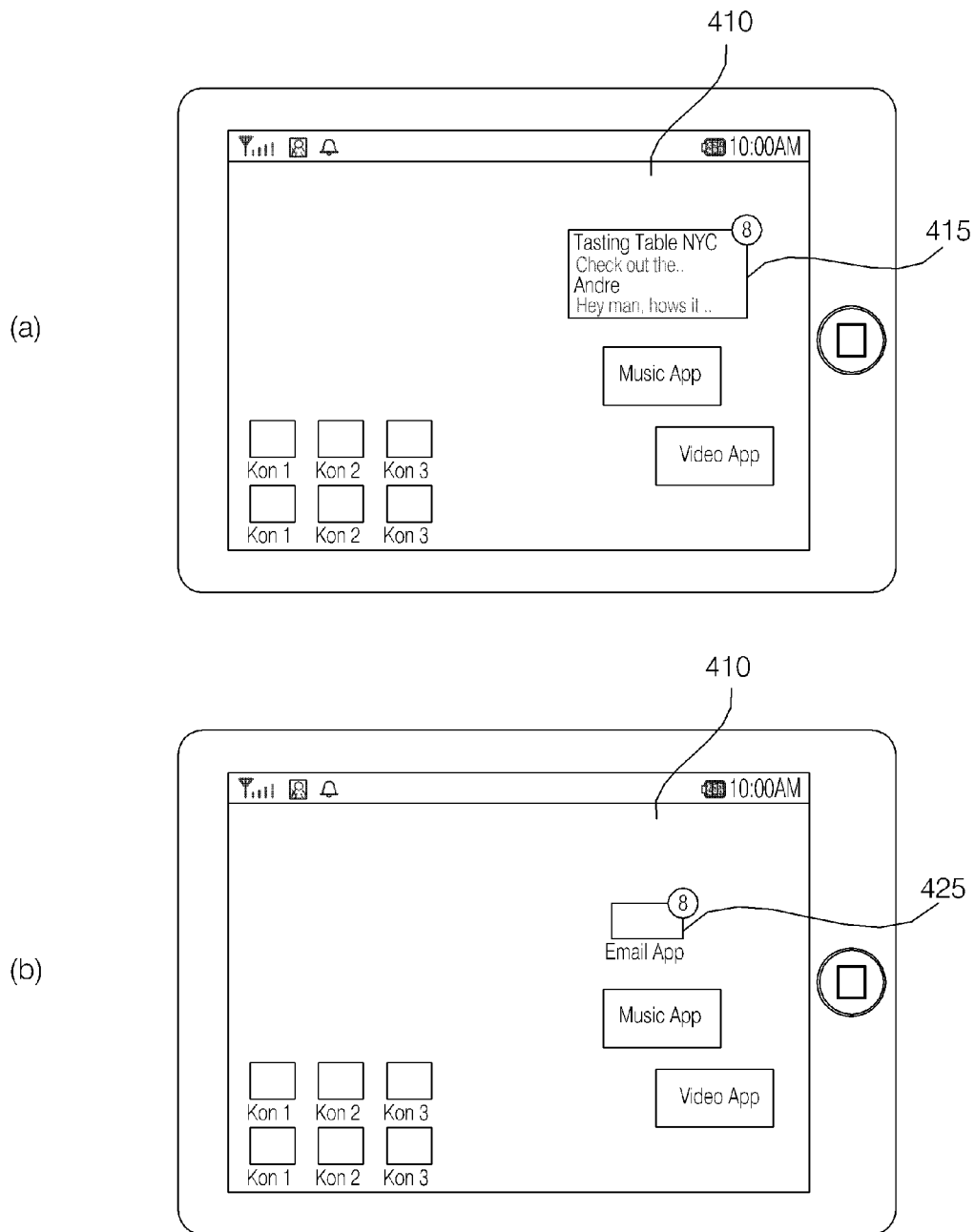


FIG. 7

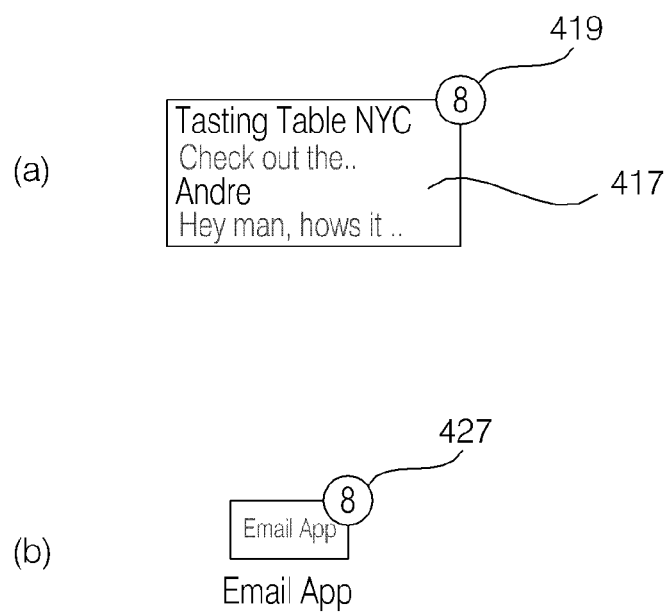


FIG. 8

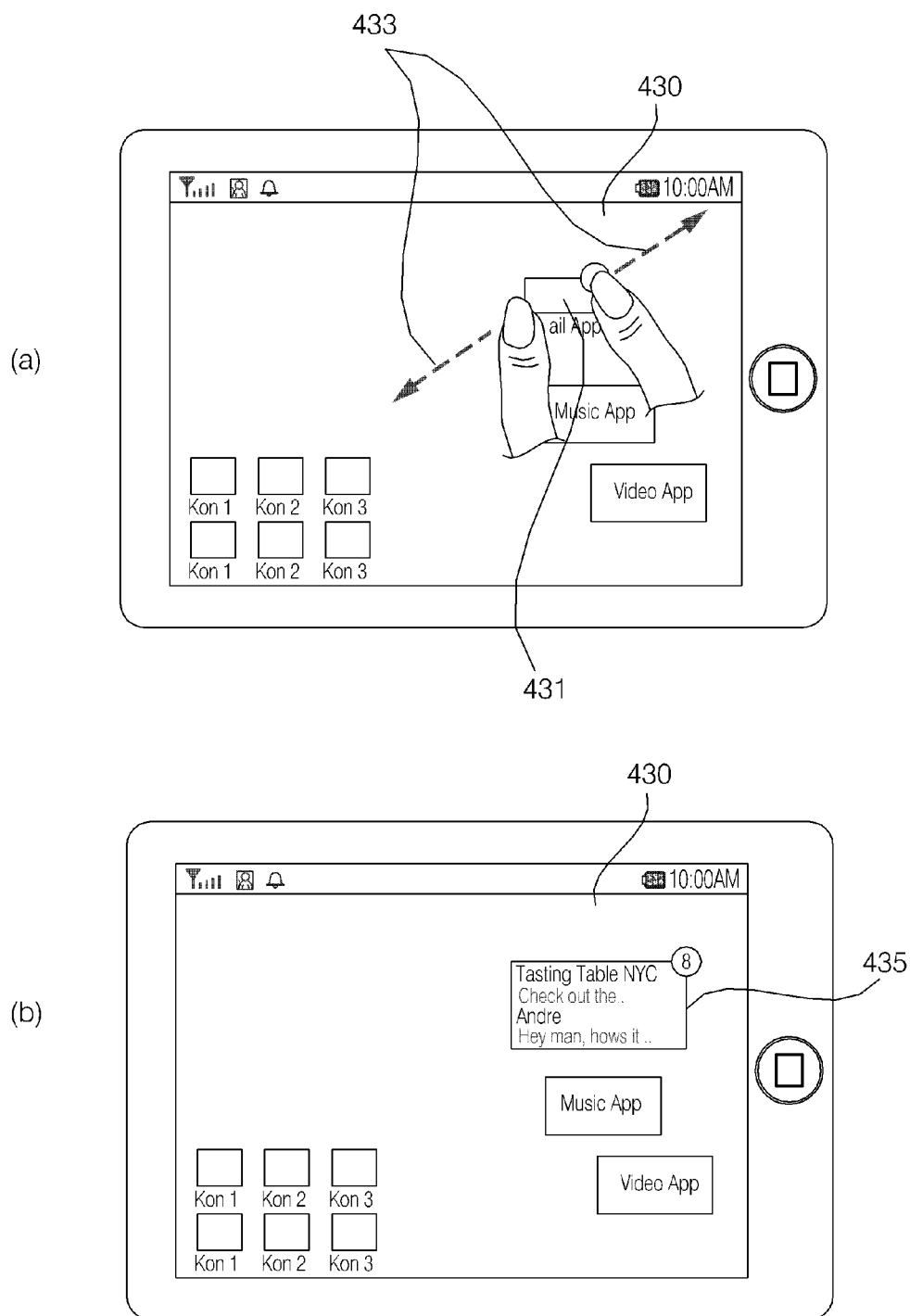


FIG. 9

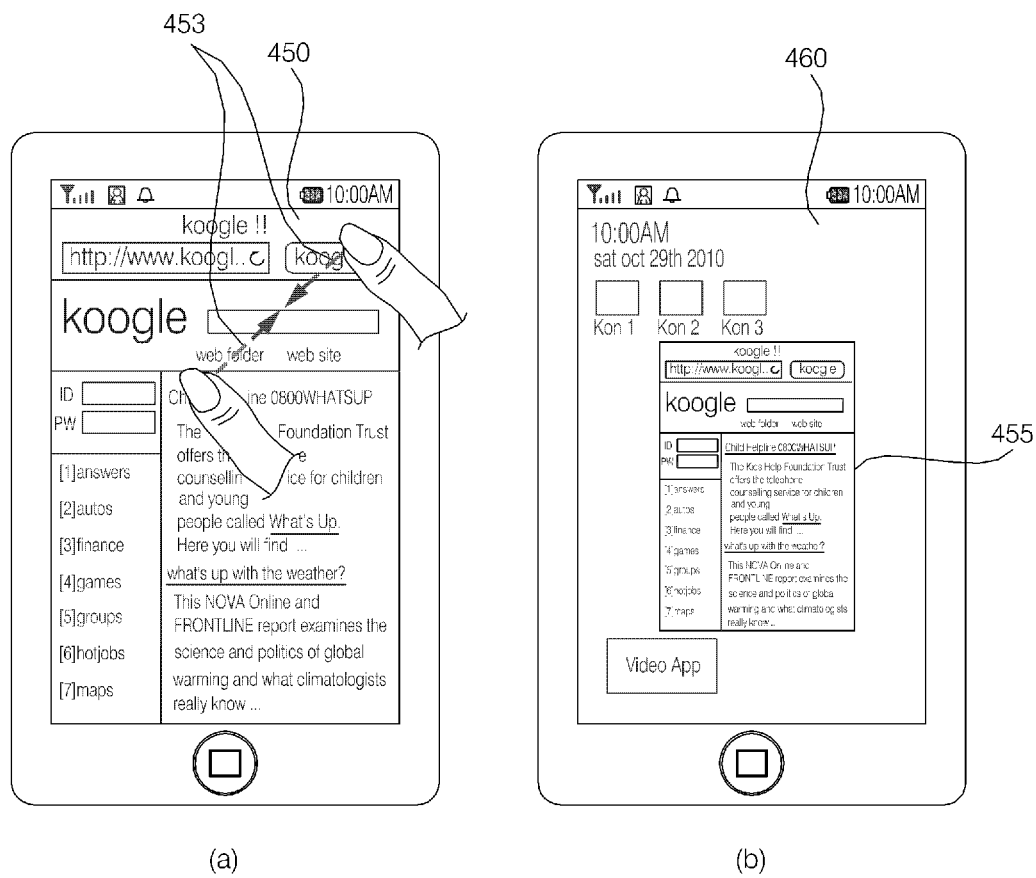


FIG. 10

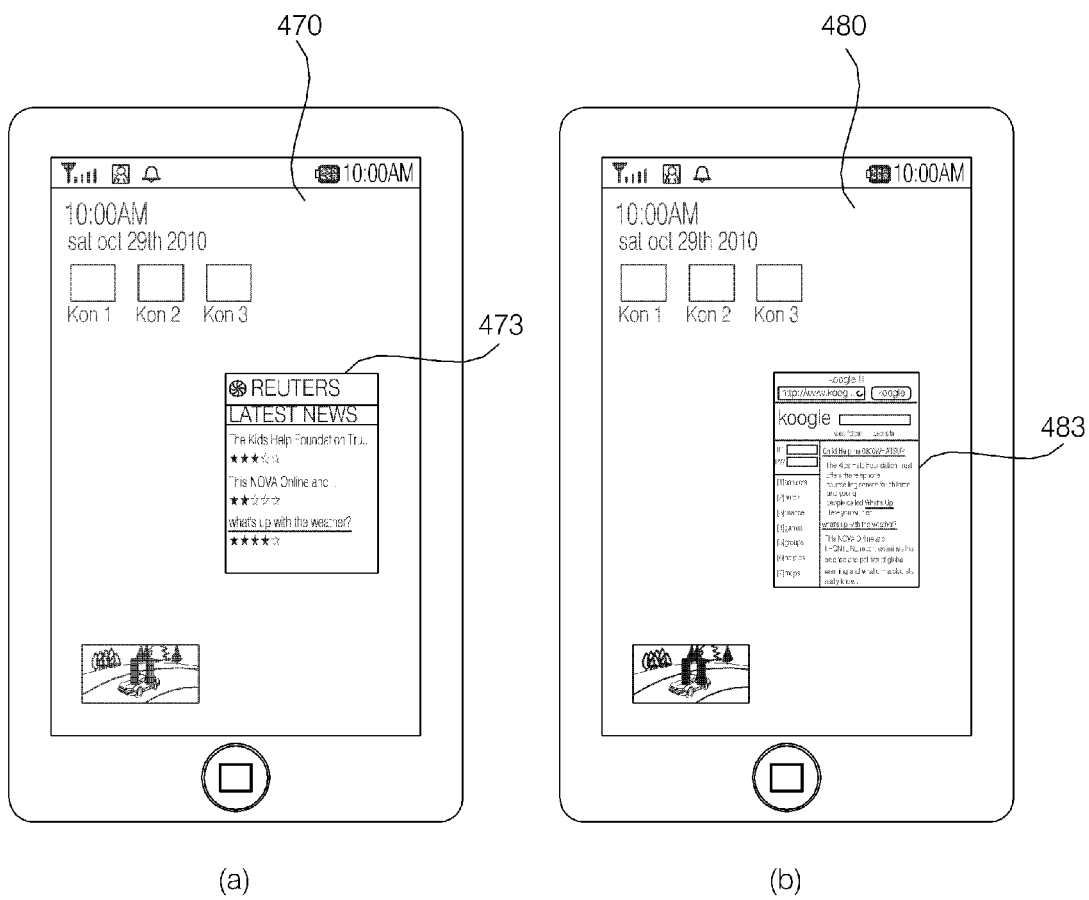


FIG. 11

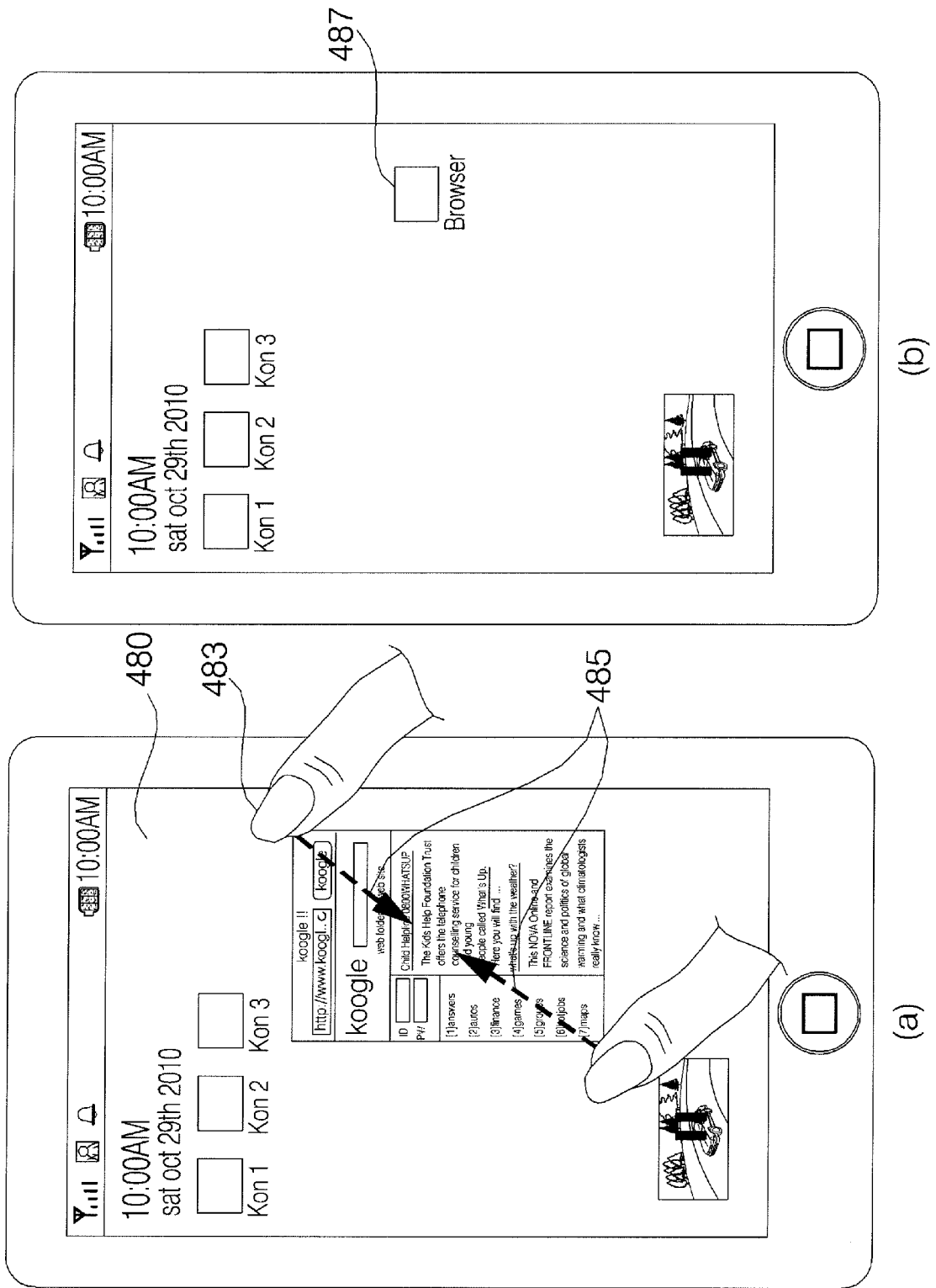
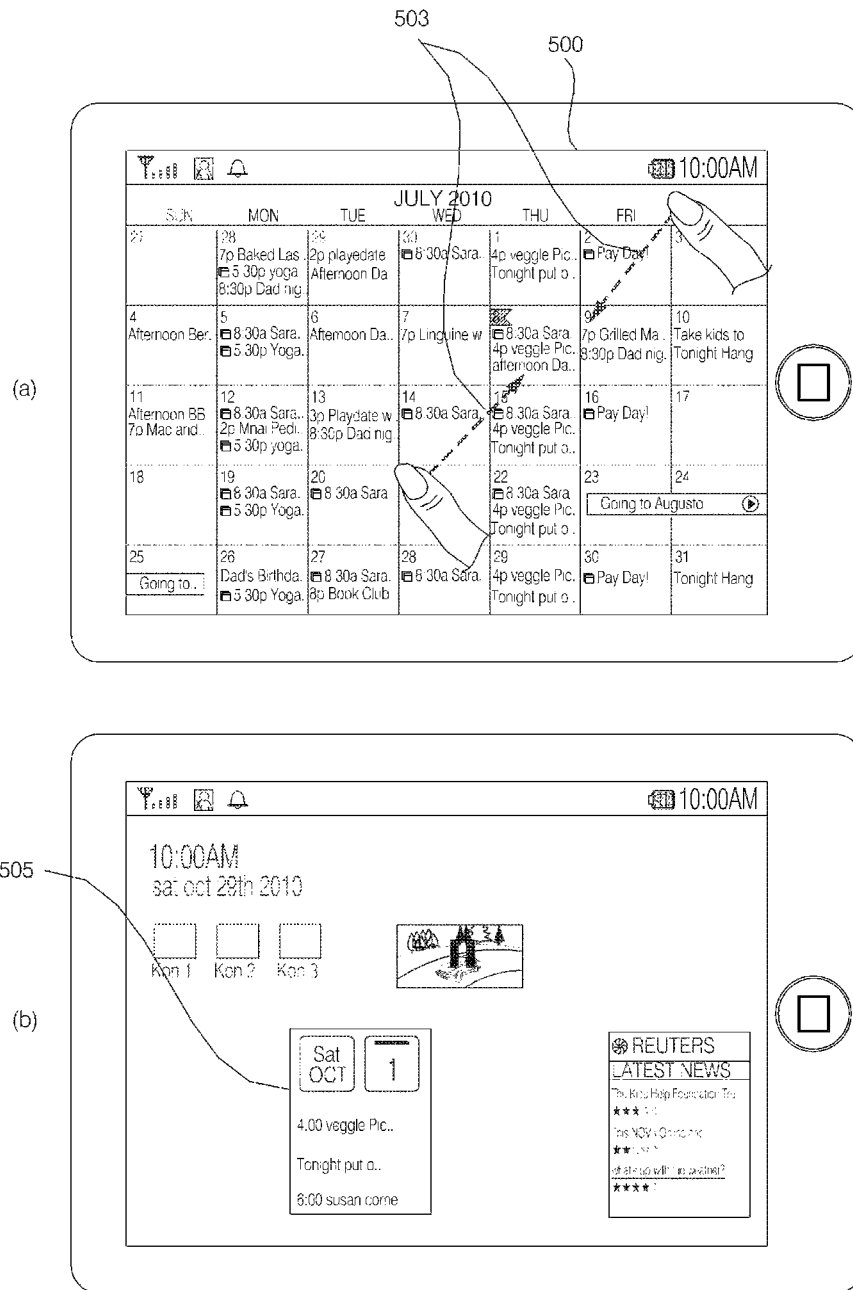


FIG. 12



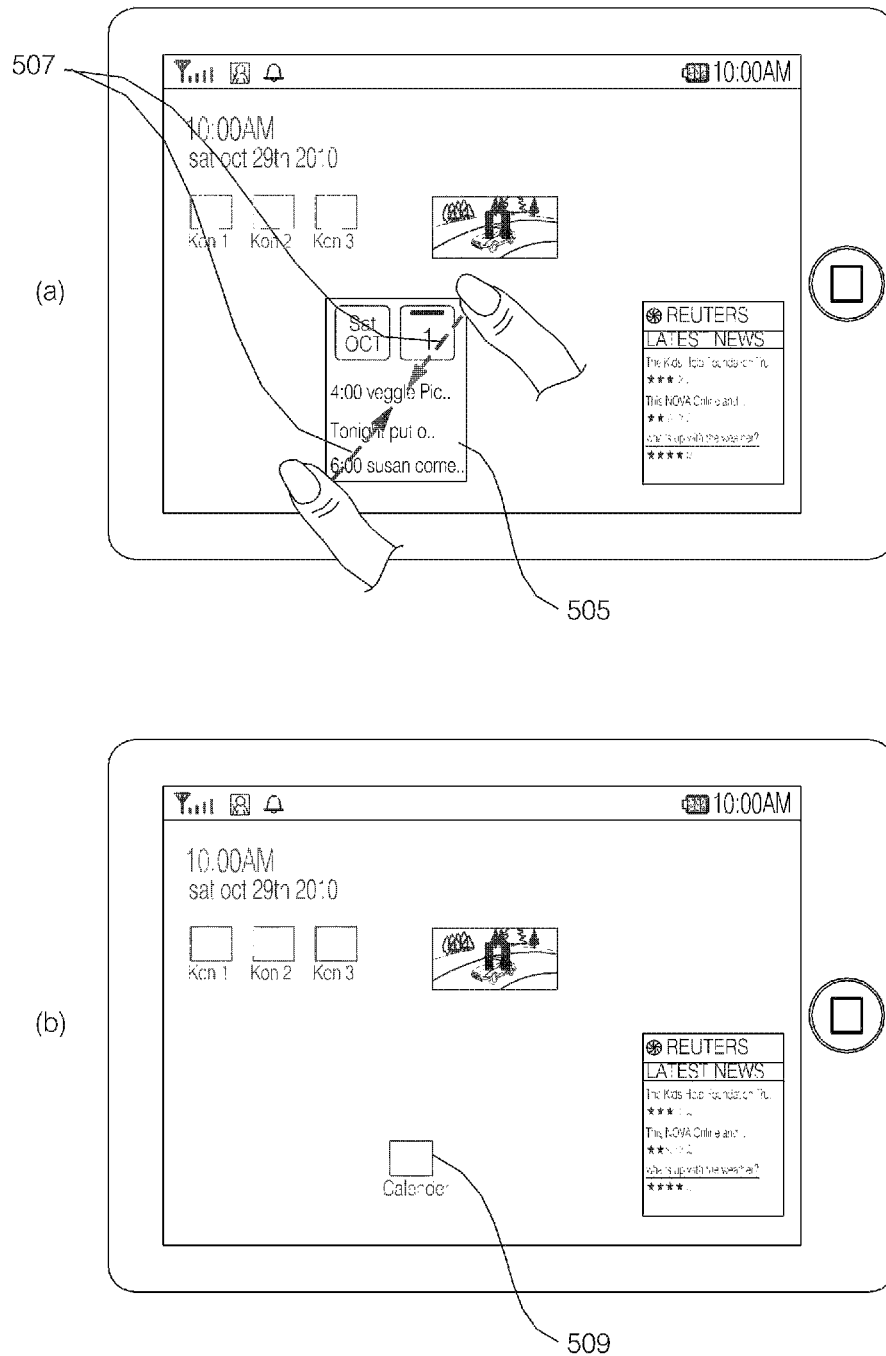


FIG. 13



FIG. 14

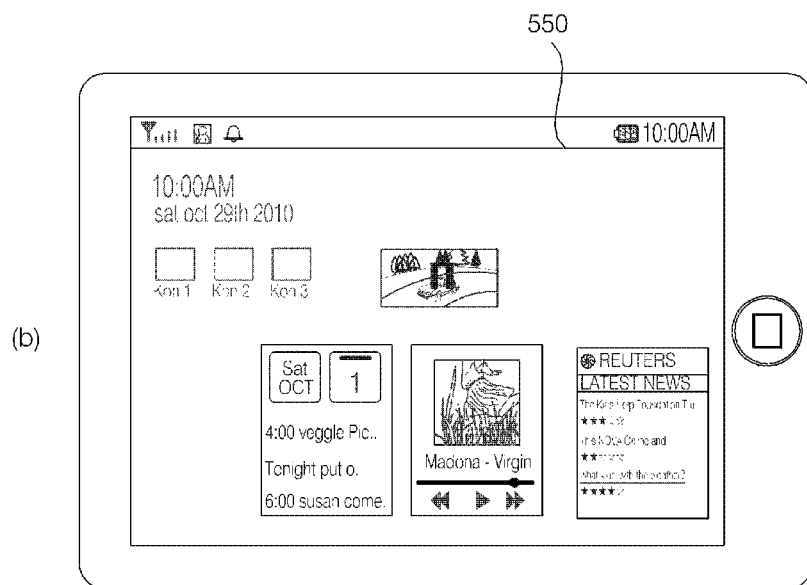
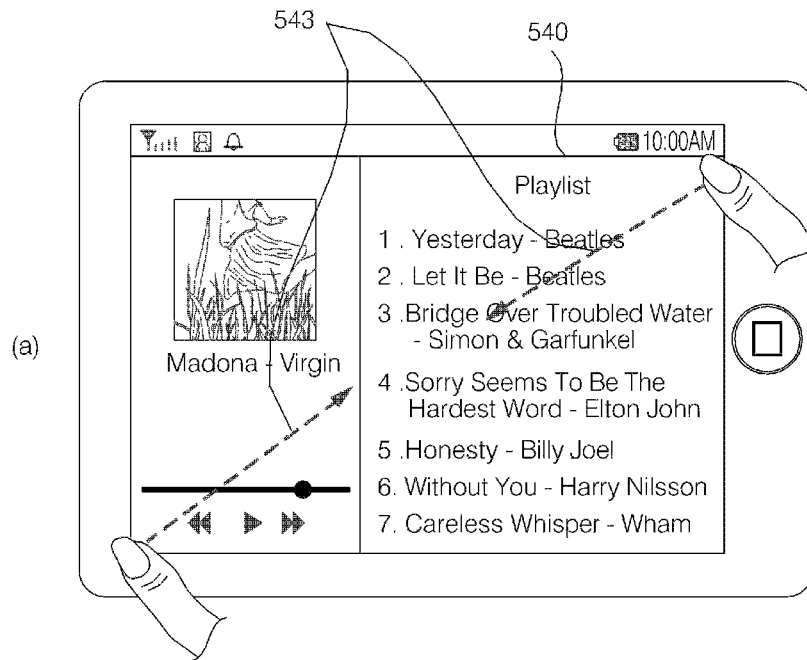


FIG. 15

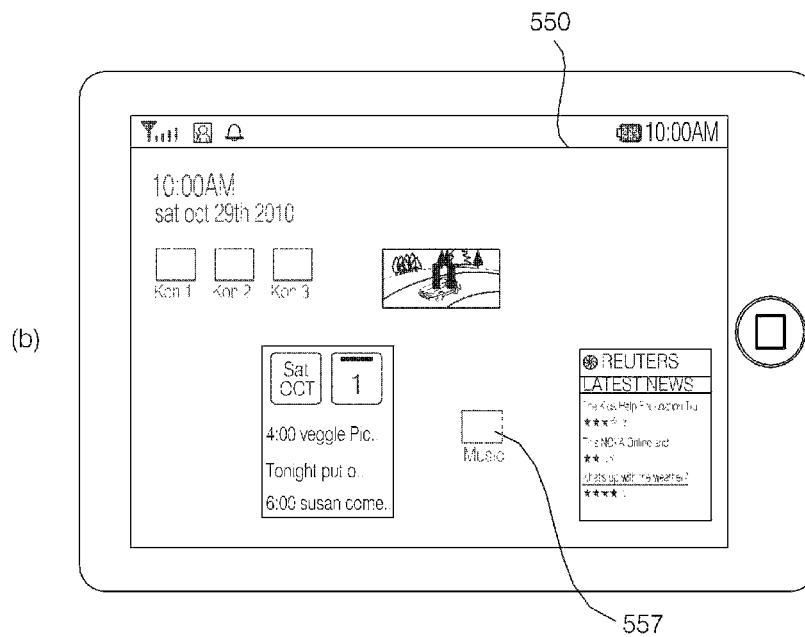
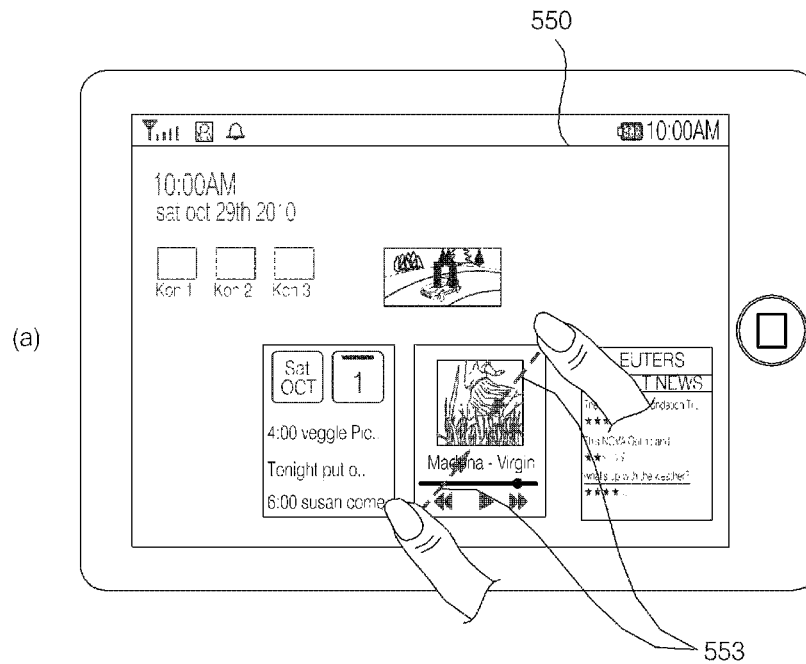


FIG. 16

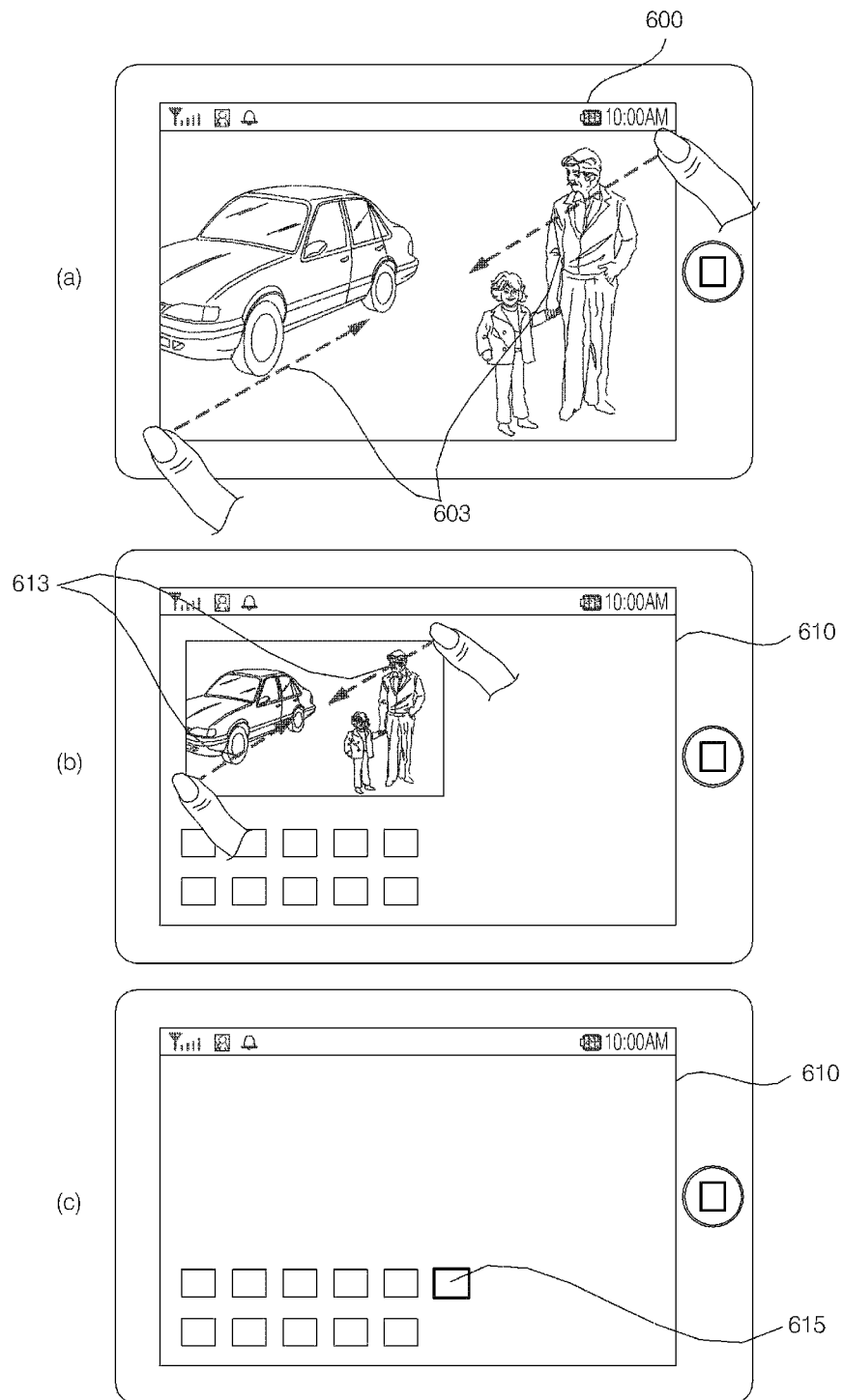
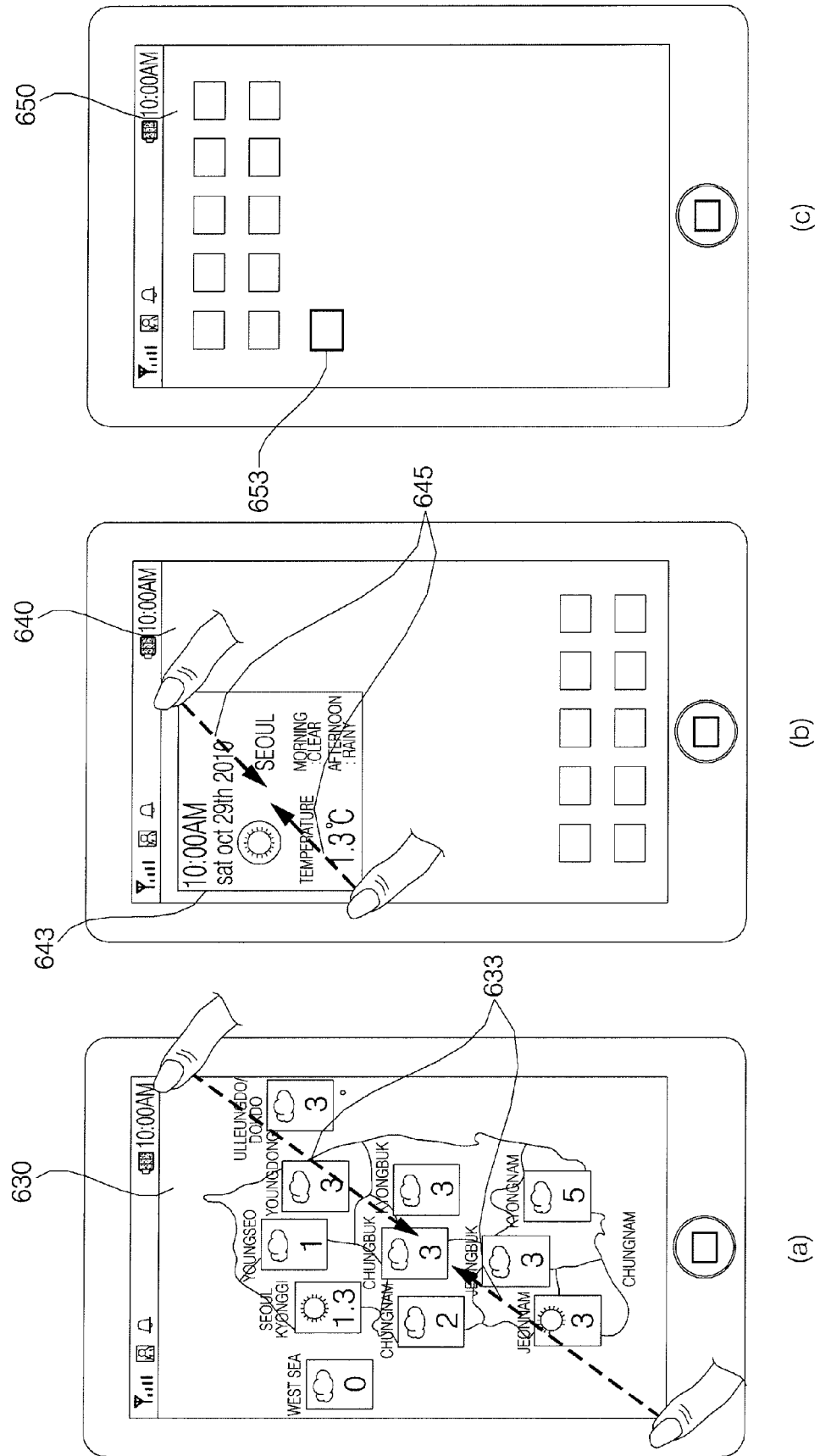


FIG. 17



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# MOBILE TERMINAL FOR CHANGING DISPLAY MODE OF AN APPLICATION BASED ON A USER INPUT OPERATION AND OPERATION CONTROL METHOD THEREOF

## CROSS-REFERENCE TO A RELATED APPLICATION

This application claims the priority benefit of Korean Patent Application No. 10-2010-0131630, filed on Dec. 21, 2010 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a mobile terminal and corresponding control method, in which various operations performed by the mobile terminal can be effectively controlled using a pinch-in or pinching-out input operation.

### 2. Description of the Related Art

Mobile terminals are portable devices providing users with various services such as a voice calling service, a video calling service, an information input/output service, and a data storage service. Mobile terminals also provide many additional functions besides the basic calling function such as capturing photos or moving pictures, playing music files or moving image files, providing game programs, receiving broadcast programs and providing wireless internet services. Thus, mobile terminals are now multimedia players.

In addition, various user interface (UI) environments allowing users to easily search for and choose desired functions have been developed. Mobile terminals have also become personal items that can represent personal individuality. Touch screens are also common in mobile terminals.

However, even mobile terminals equipped with touch screens require users to navigate through numerous menus to perform certain functions or operations, and thus causes inconvenience.

## SUMMARY OF THE INVENTION

Accordingly, one object of the present invention is to address the above noted and other problems with the related art.

Another object of the present invention is to provide a mobile terminal and corresponding control method for effectively performing various operations using a pinching-in or pinching-out input operation.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, the present invention provides in one aspect a method of controlling a mobile terminal including allowing, via a wireless communication unit on the mobile terminal, wirelessly communication with at least one other terminal; displaying, on a display of the mobile terminal, an application screen corresponding to an execution of an application on the mobile terminal; reducing, via a controller on the mobile terminal, a size of the application screen in response to a reduction input operation performed on the mobile terminal; determining, via the controller, if the application screen is reduced below a predetermined size; displaying, via the display, a widget corresponding to the application instead of the application screen on the display when the application screen is reduced below the predetermined size; and expanding, via the controller, the application

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screen back to its original size before the reduction input operation has been performed when the application screen is not reduced below the predetermined size.

In another aspect, the present invention provides a mobile terminal including a wireless communication unit configured to wirelessly communicate with at least one other terminal; a display configured to display an application screen corresponding to an execution of an application on the mobile terminal; and a controller configured to reduce a size of the application screen in response to a reduction input operation performed on the mobile terminal, to determine if the application screen is reduced below a predetermined size, to control the display to display a widget corresponding to the application instead of the application screen on the display when the application screen is reduced below the predetermined size, and to expand the application screen back to its original size before the reduction input operation has been performed when the application screen is not reduced below the predetermined size.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

## BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 is a block diagram of a mobile terminal according to an embodiment of the present invention;

FIG. 2 is a front perspective view of the mobile terminal shown in FIG. 1;

FIGS. 3A and 3B are flowcharts illustrating a method of controlling a mobile terminal according to an embodiment of the present invention;

FIG. 4 is a diagram illustrating the embodiment of FIGS. 3A and 3B; and

FIGS. 5 through 17 are diagrams illustrating display screens for explaining the embodiments of FIGS. 3A and 3B.

## DETAILED DESCRIPTION OF THE INVENTION

The present invention will hereinafter be described in detail with reference to the accompanying drawings in which embodiments of the invention are shown. The term 'mobile terminal' as used herein may indicate a mobile phone, a smart phone, a laptop computer, a digital broadcast receiver, a personal digital assistant (PDA), a portable multimedia player (PMP), a camera, a navigation device, a tablet computer, or an electronic book (e-book) reader. In this disclosure, the terms 'module' and 'unit' can be used interchangeably.

FIG. 1 illustrates a block diagram of a mobile terminal 100 according to an embodiment of the present invention. Referring to FIG. 1, the mobile terminal 100 includes a wireless communication unit 110, an audio/video (A/V) input unit 120, a user input unit 130, a sensing unit 140, an output unit 150, a memory 160, an interface unit 170, a controller 180, and a power supply unit 190. Two or more of

the wireless communication unit **110**, the A/V input unit **120**, the user input unit **130**, the sensing unit **140**, the output unit **150**, the memory **160**, the interface unit **170**, the controller **180**, and the power supply unit **190** may be incorporated into a single unit, or some of the wireless communication unit **110**, the A/V input unit **120**, the user input unit **130**, the sensing unit **140**, the output unit **150**, the memory **160**, the interface unit **170**, the controller **180**, and the power supply unit **190** may be divided into two or more smaller units.

Further, the wireless communication unit **110** includes a broadcast reception module **111**, a mobile communication module **113**, a wireless internet module **115**, a short-range communication module **117**, and a global positioning system (GPS) module **119**. In addition, the broadcast reception module **111** can receive a broadcast signal and/or broadcast-related information from an external broadcast management server through a broadcast channel. The broadcast channel may be a satellite channel or a terrestrial channel. The broadcast management server may be a server which generates broadcast signals and/or broadcast-related information and transmits the generated broadcast signals and/or the generated broadcast-related information or may be a server which receives and then transmits previously-generated broadcast signals and/or previously-generated broadcast-related information.

In addition, the broadcast-related information may include broadcast channel information, broadcast program information and/or broadcast service provider information. The broadcast signal may be a TV broadcast signal, a radio broadcast signal, a data broadcast signal, the combination of a data broadcast signal and a TV broadcast signal or the combination of a data broadcast signal and a radio broadcast signal. The broadcast-related information may also be provided to the mobile terminal **100** through a mobile communication network. In this instance, the broadcast-related information may be received by the mobile communication module **113**, rather than by the broadcast reception module **111**. The broadcast-related information may also come in various forms such as an electronic program guide (EPG) of the digital multimedia broadcasting (DMB) system or an electronic service guide (ESG) of the digital video broadcast-handheld (DVB-H) system.

In addition, the broadcast reception module **111** may receive the broadcast signal using various broadcasting systems such as the digital multimedia broadcasting-terrestrial (DMB-T) system, the digital multimedia broadcasting-satellite (DMB-S) system, the media forward link only (MediaFLO) system, the DVB-H system, and the integrated services digital broadcast-terrestrial (ISDB-T) system. In addition, the broadcast reception module **111** may be configured to be suitable for nearly all types of broadcasting systems other than those set forth herein. The broadcast signal and/or the broadcast-related information received by the broadcast reception module **111** may also be stored in the memory **160**.

The mobile communication module **113** can also transmit wireless signals to or receives wireless signals from at least one of a base station, an external terminal, and a server through a mobile communication network. The wireless signals may include various types of data according to whether the mobile terminal **100** transmits/receives voice call signals, video call signals, or text/multimedia messages.

The wireless internet module **115** corresponds to a module for wirelessly accessing the internet. The wireless internet module **115** may be embedded in the mobile terminal **100** or may be installed in an external device. The wireless internet module **115** may also use various wireless internet technolo-

gies such as wireless local area network (WLAN), Wireless Broadband (WiBro), World Interoperability for Microwave Access (Wimax), and High Speed Downlink Packet Access (HSDPA).

Further, the short-range communication module **117** is a module for short-range communication and may use various short-range communication techniques such as Bluetooth, radio frequency identification (RFID), infrared data association (IrDA), ultra wideband (UWB), and ZigBee. The GPS module **119** also receives position information from a plurality of GPS satellites.

In addition, the A/V input unit **120** may be used to receive audio signals or video signals. In FIG. 1, the A/V input unit **120** includes a camera **121** and a microphone **123**. The camera **121** can process various image frames such as still images or moving images captured by an image sensor during a video call mode or an image capturing mode, and the image frames processed by the camera **121** may be displayed by a display module **151**. The image frames processed by the camera **121** may also be stored in the memory **160** or may be transmitted to an external device through the wireless communication unit **110**. The mobile terminal **100** may also include two or more cameras **121**.

Further, the microphone **123** can receive external sound signals during a call mode, a recording mode, or a voice recognition mode with the use of a microphone and convert the sound signals into electrical sound data. In the call mode, the mobile communication module **113** converts the electrical sound data into data that can be readily transmitted to a mobile communication base station and then output the data obtained by the conversion. The microphone **123** may also use various noise removal algorithms to remove noise that may be generated during the reception of external sound signals.

Also, the user input unit **130** may generate key input data based on user input for controlling the operation of the mobile terminal **100**. The user input unit **130** may be implemented as a keypad, a dome switch, or a static pressure or capacitive touch pad which is capable of receiving a command or information by being pushed or touched by a user. Alternatively, the user input unit **130** may be implemented as a wheel, a jog dial or wheel, or a joystick capable of receiving a command or information by being rotated. Still alternatively, the user input unit **130** may be implemented as a finger mouse. In particular, when the user input unit **130** is implemented as a touch pad and forms a mutual layer structure with the display module **151**, the user input unit **130** and the display module **151** may be collectively referred to as a touch screen.

Further, the sensing unit **140** determines a current state of the mobile terminal **100** such as whether the mobile terminal **100** is opened or closed, the position of the mobile terminal **100** and whether the mobile terminal **100** is placed in contact with a user, and generates a sensing signal for controlling the operation of the mobile terminal **100**. For example, when the mobile terminal **100** is a slider-type mobile phone, the sensing unit **140** can determine whether the mobile terminal **100** is opened or closed. In addition, the sensing unit **140** can determine whether the mobile terminal **100** is powered by the power supply unit **190** and whether the interface unit **170** is connected to an external device.

In addition, in FIG. 1, the sensing unit **140** includes a detection sensor **141**, a pressure sensor **143** and a motion sensor **145**. The detection sensor **141** determines whether there is an object nearby and approaching the mobile terminal **100** without any mechanical contact. More specifically, the detection sensor **141** can detect an object that is

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nearby and approaching by detecting a change in an alternating magnetic field or the rate of change of static capacitance. The sensing unit **140** may also include two or more detection sensors **141**.

Further, the pressure sensor **143** determines whether pressure is being applied to the mobile terminal **100** or measures the level of pressure, if any, applied to the mobile terminal **100**. The pressure sensor **143** may be installed in a certain part of the mobile terminal **100** where the detection of pressure is necessary. For example, the pressure sensor **143** may be installed in the display module **151**. In this instance, it is possible to differentiate a typical touch input from a pressure touch input, which is generated using a higher pressure level than that used to generate a typical touch input, based on data provided by the pressure sensor **143**. In addition, when a pressure touch input is received through the display module **151**, it is possible to determine the level of pressure applied to the display module **151** upon the detection of a pressure touch input based on data provided by the pressure sensor **143**.

Also, the motion sensor **145** determines the location and motion of the mobile terminal **100** using an acceleration sensor or a gyro sensor, for example. In more detail, acceleration sensors are a type of device for converting a vibration in acceleration into an electric signal. With recent developments in micro-electromechanical system (MEMS) technology, acceleration sensors have been widely used in various products for various purposes ranging from detecting large motions such as car collisions as performed in airbag systems for automobiles to detecting minute motions such as the motion of the hand as performed in gaming input devices.

In general, one or more acceleration sensors representing two or three axial directions are incorporated into a single package. There are some cases when the detection of only one axial direction, for example, a Z-axis direction, is necessary. Thus, when an X- or Y-axis acceleration sensor instead of a Z-axis acceleration sensor is required, the X- or Y-axis acceleration sensor may be mounted on an additional substrate, and the additional substrate may be mounted on a main substrate. In addition, gyro sensors measure angular velocity, and may determine the relative direction of the rotation of the mobile terminal **100** to a reference direction.

Also, the output unit **150** can output audio signals, video signals and alarm signals, and in FIG. 1, includes the display module **151**, an audio output module **153**, an alarm module **155**, and a haptic module **157**. Further, the display module **151** displays various information processed by the mobile terminal **100**. For example, when the mobile terminal **100** is in a call mode, the display module **151** can display a user interface (UI) or a graphic user interface (GUI) for making or receiving a call. When the mobile terminal **100** is in a video call mode or an image capturing mode, the display module **151** can display a UI or a GUI for capturing or receiving images.

In addition, when the display module **151** and the user input unit **130** form a layer structure together and are thus implemented as a touch screen, the display module **151** may be used as both an output device and an input device. When the display module **151** is implemented as a touch screen, the display module **151** may also include a touch screen panel and a touch screen panel controller. In more detail, the touch screen panel is a transparent panel attached onto the exterior of the mobile terminal **100** and may be connected to an internal bus of the mobile terminal **100**.

The touch screen panel also continuously monitors whether the touch screen panel is being touched by the user.

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Once a touch input to the touch screen panel is received, the touch screen panel transmits a number of signals corresponding to the touch input to the touch screen panel controller. The touch screen panel controller then processes the signals transmitted by the touch screen panel, and transmits the processed signals to the controller **180**. Then, the controller **180** determines whether a touch input has been generated and which part of the touch screen panel has been touched based on the processed signals transmitted by the touch screen panel controller.

The display module **151** may include electronic paper (e-paper). In particular, e-paper is a type of reflective display technology and can provide as high resolution as ordinary ink on paper, wide viewing angles, and excellent visual properties. E-paper can also be implemented on various types of substrates such as a plastic, metallic or paper substrate and can display and maintain an image thereon even after power is cut off. In addition, e-paper can reduce the power consumption of the mobile terminal **100** because it does not require a backlight assembly. The display module **151** may be implemented as e-paper by using electrostatic-charged hemispherical twist balls, using electrophoretic deposition, or using microcapsules.

Further, the display module **151** may include at least one of a liquid crystal display (LCD), a thin film transistor (TFT)-LCD, an organic light-emitting diode (OLED), a flexible display, and a three-dimensional (3D) display. The mobile terminal **100** may also include two or more display modules **151**. For example, the mobile terminal **100** may include an external display module and an internal display module.

Also, the audio output module **153** outputs audio data received by the wireless communication unit **110** during a call reception mode, a call mode, a recording mode, a voice recognition mode, or a broadcast reception mode or outputs audio data present in the memory **160**. In addition, the audio output module **153** may output various sound signals associated with the functions of the mobile terminal **100** such as receiving a call or a message. The audio output module **153** may also include a speaker and a buzzer.

The alarm module **155** outputs an alarm signal indicating the occurrence of an event in the mobile terminal **100**. Examples of the event include receiving a call signal, receiving a message, and receiving a key signal. Examples of the alarm signal output by the alarm module **155** include an audio signal, a video signal and a vibration signal. More specifically, the alarm module **155** may output an alarm signal upon receiving a call signal or a message. In addition, the alarm module **155** may receive a key signal and may output an alarm signal as feedback to the key signal. Therefore, the user can easily recognize the occurrence of an event based on an alarm signal output by the alarm module **155**. An alarm signal for notifying the user of the occurrence of an event may be output not only by the alarm module **155** but also by the display module **151** or the audio output module **153**.

In addition, the haptic module **157** provides various haptic effects such as vibration that can be perceived by the user. When the haptic module **157** generates vibration as a haptic effect, the intensity and the pattern of vibration generated by the haptic module **157** may be altered in various manners. The haptic module **157** can also synthesize different vibration effects and output the result of the synthesis. Alternatively, the haptic module **157** can sequentially output different vibration effects.

Further, the haptic module **157** can provide various haptic effects, other than vibration, such as a haptic effect obtained

using a pin array that moves perpendicularly to a contact skin surface, a haptic effect obtained by injecting or sucking in air through an injection hole or a suction hole, a haptic effect obtained by giving a stimulus to the surface of the skin, a haptic effect obtained through contact with an electrode, a haptic effect obtained using an electrostatic force, and a haptic effect obtained by realizing the sense of heat or cold using a device capable of absorbing heat or generating heat. The haptic module **157** may be configured to enable the user to recognize a haptic effect using the kinesthetic sense of the fingers or the arms. The mobile terminal **100** may also include two or more haptic modules **157**.

Also, the memory **160** stores various programs necessary for the operation of the controller **180**. In addition, the memory **160** may temporarily store various data such as a phonebook, messages, still images, or moving images. In addition, the memory **160** may include at least one of a flash memory type storage medium, a hard disk type storage medium, a multimedia card micro type storage medium, a card type memory (e.g., a secure digital (SD) or extreme digital (XD) memory), a random access memory (RAM), and a read-only memory (ROM). The mobile terminal **100** may also operate a web storage on the internet, which performs the functions of the memory **160**.

Further, the interface unit **170** can interface with an external device that can be connected to the mobile terminal **100**. The interface unit **170** may be a wired/wireless headset, an external battery charger, a wired/wireless data port, a card socket for, for example, a memory card, a subscriber identification module (SIM) card or a user identity module (UIM) card, an audio input/output (I/O) terminal, a video I/O terminal, or an earphone. The interface unit **170** can also receive data from an external device or may be powered by an external device, and transmit data provided by an external device to other components in the mobile terminal **100** or transmit data provided by other components in the mobile terminal **100** to an external device. When the mobile terminal **100** is connected to an external cradle, the interface unit **170** provides a path for supplying power from the external cradle to the mobile terminal **100** or for transmitting various signals from the external cradle to the mobile terminal **100**.

Also, the controller **180** controls the general operation of the mobile terminal **100**. For example, the controller **180** can perform various control operations regarding making/receiving a voice call, transmitting/receiving data, or making/receiving a video call. In FIG. 1, the controller **180** includes a multimedia player module **181**, which plays multimedia data. The multimedia player module **181** may be implemented as a hardware device and may be installed in the controller **180**. Alternatively, the multimedia player module **181** may be implemented as a software program.

Further, the power supply unit **190** may be supplied with power by an external power source or an internal power source and may supply power to the other components in the mobile terminal **100**. The mobile terminal **100** may also be operated with a wired/wireless communication system or a satellite communication system and thus operate in a communication system capable of transmitting data in units of frames or packets.

The exterior structure of the mobile terminal **100** (e.g., a tablet computer) will now be described in detail with reference to FIG. 2, which is a front perspective view of the mobile terminal **100**. Referring to FIG. 2, the exterior of the mobile terminal **100** includes a front case **100-1** and a rear case **100-2**. Various electronic devices can be installed in the space formed by the front case **100-1** and the rear case **100-2**. The front case **100-1** and the rear case **100-2** may also

be formed of a synthetic resin through injection molding. Alternatively, the front case **100-1** and the rear case **100-2** may be formed of a metal such as stainless steel (STS) or titanium (Ti).

In addition, as shown, the display module **151**, the audio output module **153**, the camera **121**, and the user input unit **130** can be disposed in the main body of the mobile terminal **100**, and particularly, on the front case **100-1**. As discussed above, when a touch pad is configured to overlap the display module **151** and thus to form a mutual layer structure, the display module **151** may serve as a touch screen. Thus, the user can enter various information to the mobile terminal **100** simply by touching the display module **151**.

Also, the audio output module **153** may be implemented as a receiver or a speaker, and the camera **121** can capture a still or moving image of the user. The microphone **123** can also receive the user's voice or other sounds. Another user input unit and an interface unit may be additionally provided on one side of the front case **100-1** or the rear case **100-2**.

Further, the user input unit **130** may employ any mechanism and additionally provide tactile feedback. For example, the user input unit **130** may be implemented as a dome switch or a touch pad that can receive a command or information according to a pressing or a touch operation by the user, or may be implemented as a wheel or jog type for rotating a key or as a joystick. In terms of function, the user input unit **130** may operate as function keys for entering commands, such as start, end, or scroll, numbers and symbols, for selecting an operating mode for the mobile terminal **100**, and for activating a special function within the mobile terminal **100**.

Another camera may be additionally provided on the rear case **100-2**. The camera at the rear of the mobile terminal **100** may have an image capture direction which is substantially the opposite to that of the camera **121**, which is provided at the front of the mobile terminal **100**, and may have a different resolution from that of the camera **121**. For example, the camera **121** may be configured to have a low resolution and thus be suitable for quickly capturing an image or video of the user's face and immediately sending the image or video to the other party during video conferencing. Meanwhile, the camera at the rear of the mobile terminal **100** may be configured to have a high resolution and thus be suitable for capturing more detailed, higher quality images or videos which typically do not need to be transmitted immediately.

Another audio output module may be additionally provided on the rear case **100-2**. The audio output module on the rear case **100-2** can also realize a stereo function along with the audio output module **153** on the front case **100-1**. The audio output module on the rear case **100-2** may also be used in a speaker-phone mode.

In addition, a broadcast signal reception antenna may be disposed at one side of the front or rear case **100-1** or **100-2**, in addition to an antenna (**105**) used for call communication. The broadcast signal reception antenna may be installed such that it can be extended from the front or rear case **100-1** or **100-2**. Further, a power supply unit may be mounted on the rear case **100-2** and supply power to the mobile terminal **100**. The power supply unit may be, for example, a chargeable battery which can be detachably combined to the rear case **100-2** for being charged.

Next, FIGS. 3A and 3B are flow charts illustrating a method of controlling a mobile terminal according to an embodiment of the present invention. Referring to FIG. 3A, when a request for the execution of a predetermined application is issued in response to a user command being



received, the controller **180** executes the predetermined application (S200). The controller **180** then displays an application screen corresponding to the predetermined application on the display module **151** (S205).

Further, the execution of the predetermined application may include executing an operation menu such as making or receiving a voice call or a video call, sending a message, accessing the internet or executing a broadcast viewer, a camera menu, a game menu, an image viewer menu, or a multimedia file player, and performing a function or program provided by the mobile terminal **100**.

The controller **180** then determines whether there is a reduction input operation performed (e.g., pinching-in input operation) on the application screen (S210). For example, a pinching-in input operation is a user input generated by performing a multi-touching operation on the display module **151** with two fingers and moving the two fingers closer to each other, and is also referred to as a pinch-close or zoom-out input. A pinching-in input operation can also be used to reduce an image or a webpage.

When the controller **180** determines there is a pinching-in input operation (Yes in S210), the controller **180** reduces the application screen in response to the pinching-in input operation (S215). When the application screen is reduced below a predetermined size in response to the pinching-in input operation (S220), the controller **180** displays a widget corresponding to the predetermined application instead of the application screen on the display module **151** (S225).

In more detail, widgets are small applications designed to facilitate access to frequently-used functions or information. That is, widgets are independently-executable web applications that are easy to develop and distribute, can be combined with various applications or services, and can be optimized for various UIs to provide only content or information relevant to the various UIs. Widgets can be classified into accessory widgets such as clock or calendar widgets, application widgets such as games or contact lists, or information widgets such as weather forecasts or stock information. Other type of widgets may also be used.

Referring to FIG. 3B, in response to the widget being displayed, the controller **180** determines whether there is an increasing input operation (e.g., a pinching-out input operation) detected on the widget (S230). In more detail, a pinching-out input operation is a user input generated by multi-touching on the display module **151** with two fingers and moving the two fingers away from each other, and is also referred to as a pinch-open or zoom-in input. A pinching-out input operation may be used to enlarge an image or a webpage.

When the controller **180** determines there is a pinching-out input operation detected on the widget (Yes in S230), the controller **180** displays the application screen back on the display module **151** (S205). On the other hand, when the controller **180** detects a pinching-in input operation on the widget (Yes in S235), the controller **180** displays a shortcut icon corresponding to the predetermined application instead of the widget on the display module **151** (S240).

When the controller **180** detects a tap on the shortcut icon (Yes in S245), the controller **180** displays the application screen back on the display module **151** (S205). When the controller **180** detects a pinching-out input operation on the shortcut icon (Yes in S250), the controller **180** displays the widget instead of the shortcut icon on the display module **151** (S225). Also, when another input operation other than a pinching-in or pinching-out input operation such as a key

input is received (Yes in S255), the controller **180** performs an operation corresponding to the received user input (S260).

According to this embodiment, it is possible to easily switch between an application screen display mode, a widget display mode, and an icon display mode in response to a pinching-in or pinching-out input operation and thus to effectively control various operations performed by the mobile terminal **100**.

Next, FIG. 4 is a flow diagram illustrating the embodiment of FIGS. 3A and 3B, and particularly, an example of how to switch between an application screen display mode, a widget display mode, and an icon display mode. Referring to FIG. 4, when an application screen is reduced below a predetermined size in response to a pinching-in input operation during an application screen display mode **300**, the mobile terminal **100** is switched to a widget display mode **310**.

When a pinching-out input operation is detected on a widget during the widget display mode **310**, the mobile terminal **100** is switched to the application screen display mode **300**. When a pinching-in input operation is detected on a widget during the widget display mode **310**, the mobile terminal **100** is switched to an icon display mode **320**. Further, when a tap on an icon is detected during the icon display mode **320**, the mobile terminal **100** is switched to the application screen display mode **300**, and the application screen displayed during the previous application screen display mode is displayed back on the display module **151**.

Also, when a pinching-out input operation is detected from a shortcut icon during the icon display mode **320**, the mobile terminal **100** is switched to the widget display mode **310**. In this manner, it is possible to effectively switch from one display mode to another display mode in response to a pinch-in or pinching-out input operation.

Next, FIGS. 5 through 17 illustrate display screens for explaining the embodiment of FIGS. 3A and 3B. Referring to FIGS. 5(a) and 5(b), when the controller **180** detects a pinching-in input operation **403** on an email screen **400**, which is displayed in response to the execution of an email application, a display screen **410** including a reduced email screen **405** obtained by reducing the email screen **400** in response to the pinching-in input operation **403** is displayed. When the email screen **400** is reduced below a predetermined size in response to the pinching-in input operation **403**, the controller **180** displays an email widget **415** corresponding to the email application as illustrated in FIG. 6(a).

When the controller **180** detects a pinching-in input operation on the email widget **415**, the controller **180** displays a shortcut icon **425** corresponding to the email application instead of the email widget **415** as illustrated in FIG. 6(b). Referring to FIG. 7(a), an email widget displays the content **417** of a most-recently received email and the number **419** of unread emails. Referring to FIG. 7(b), a shortcut icon corresponding to an email application displays the number **427** of unread emails.

As described above with reference to FIGS. 5 through 7, a widget or a shortcut icon corresponding to an application may be configured to display additional information regarding the execution of the application. A user can also set in advance what information should be displayed as the additional information.

Referring to FIGS. 8(a) and 8(b), when the controller **180** detects a pinching-out input operation **433** on a display screen **430** showing a shortcut icon **431**, the controller **180**

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displays a widget **435** instead of the shortcut icon **431**. When the controller **180** detects a pinching-out input operation on the widget **435** or a tap on the shortcut icon **431**, the controller **180** displays an application screen corresponding to the widget **435**.

Referring to FIGS. **9(a)** and **9(b)**, when the controller **180** detects a pinching-in input operation **453** on a webpage screen **450**, which is displayed on the entire display module **151**, the controller **180** displays a display screen **460** including a reduced webpage screen **455** obtained by reducing the webpage screen **450** in response to the pinching-in input operation **453**. When the webpage screen **450** is reduced below a predetermined size in response to the pinching-in input operation **453**, the controller **180** displays a widget **473** corresponding to the webpage screen **450** as illustrated in FIG. **10(a)**.

Referring to FIG. **10(a)**, when a website corresponding to the webpage screen **450** provides a resource description framework (RDF) site summary (RSS), the controller **180** displays a display screen **470** including an RSS widget **473**. On the other hand, referring to FIG. **10(b)**, when the website corresponding to the webpage screen **450** does not provide an RSS, the controller **180** displays a display screen **480** including a typical widget **483** corresponding to the webpage screen **450**. Further, RSS is a family of web feed formats used for online information providers to syndicate or distribute various web content items such as news headlines to web users.

Referring to FIGS. **11(a)** and **11(b)**, when the controller **180** detects a pinching-in input operation **485** on the widget **483** of the display screen **480**, the controller **180** displays a shortcut icon **487** corresponding to the webpage screen **450** instead of the widget **483**. Referring to FIGS. **12(a)** and **12(b)**, when a display screen **500** displayed on the entire display module **151** is reduced below a predetermined size in response to a pinching-in input operation **503** being detected on the display screen **500**, the controller **180** displays a calendar widget **505** including the current date and other date-related information.

Referring to FIGS. **13(a)** and **13(b)**, when the controller **180** detects a pinching-in input operation **507** on the calendar widget **505**, the controller **180** displays a shortcut icon **509** including the current date. Referring to FIGS. **14(a)** and **14(b)**, when a music album screen **540** is reduced below a predetermined size in response to a pinching-in input operation **543** being detected on the music album screen **540**, the controller **180** displays a display screen **550** including one or more widgets regarding an album title or regarding the playing of the music.

Referring to FIGS. **15(a)** and **15(b)**, when a pinching-in input operation **553** is detected on the widget regarding the playback of music, the controller **180** displays a shortcut icon **557** corresponding to the music album screen **540**. Referring to FIGS. **16(a)** and **16(b)**, when a pinching-in input operation **603** is detected on a video player screen **600**, the controller **180** displays a display screen **610** including a widget regarding the playback of a video file. Referring to FIGS. **16(b)** and **16(c)**, when a pinching-in input operation **613** is detected on the widget regarding the playback of a video file, the controller **180** displays a display screen **610** including a shortcut icon **615** corresponding to the playback of a video file aligned along with other icons.

Further, when the mobile terminal **100** is switched from an application screen display mode to a widget display mode in response to a pinching-in input operation during the playback of a video file, the controller **180** can temporarily stop the playback of the video file. When the mobile terminal

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**100** is switched back to the widget display mode in response to a pinching-out input operation, the controller **180** can display a video player screen previously displayed during the last previous application screen display mode back on the display module **151**, and resume the playback of the video file.

Referring to FIGS. **17(a)** and **17(b)**, when the controller **180** detects a pinching-in input operation **633** on a weather forecast screen **630**, the controller **180** displays a display screen **640** including a widget **643** displaying current weather information based on a user's current location. Referring to FIGS. **17(b)** and **17(c)**, when the controller **180** detects a pinching-in input operation **645** on the widget **643**, the controller **180** displays a display screen **650** on which a shortcut icon **653** corresponding to the weather forecast screen **630** is aligned with other icons.

Further, in another embodiment of the present invention, the controller **180** can display the widgets in a slide mode in response to a pinching-in input operation being detected from a gallery screen. Further, the controller **180** can display widgets including/displaying recently-updated Twitter feeds in response to a pinching-in input operation being detected on a Twitter screen. In still another embodiment of the present invention, the controller **180** can display widgets including/displaying recently-created memos in response to a pinching-in input operation being detected from a list of memos. In addition, the controller **180** can convert an application screen providing an alarm function or a music player function into a widget displaying/including the current date and time in response to a pinching-in input operation being detected on the application screen.

In still another embodiment of the present invention, the controller **180** can convert a stock screen into a stock widget including/displaying daily stock market indexes and stock prices in response to a pinching-in input operation being detected from the stock screen. The controller **180** can also convert a document viewer screen into a widget having a recently-viewed document page as its cover in response to a pinching-in input operation being detected from the document viewer screen. However, the present invention is not restricted to the embodiments set forth herein, and can be applied to various application screens.

Further, the present invention can be realized as code that can be read by a processor (such as a mobile station modem (MSM)) included in a mobile terminal and that can be written on a computer-readable recording medium. The computer-readable recording medium may be any type of recording device in which data is stored in a computer-readable manner. Examples of the computer-readable recording medium include a ROM, a RAM, a CD-ROM, a magnetic tape, a floppy disc, an optical data storage, and a carrier wave (e.g., data transmission through the internet). The computer-readable recording medium can be distributed over a plurality of computer systems connected to a network so that computer-readable code is written thereto and executed therefrom in a decentralized manner. Functional programs, code, and code segments needed for realizing the present invention can be easily construed by one of ordinary skill in the art.

As described above, according to embodiments of the present invention, it is possible to control various operations performed by a mobile terminal such as switching between an application screen display mode and a shortcut icon display mode in response to a pinch-in or pinching-out input operation. In addition, it is possible to improve the convenience of the manipulation of a mobile terminal by using a

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pinching-in input operation and a pinching-out input operation together with other user inputs such as a key input or a touch input.

Further, the controller 180 can expand the application screen back to its original size before the reduction input operation has been performed when the application screen is not reduced below the predetermined size

The present invention encompasses various modifications to each of the examples and embodiments discussed herein. According to the invention, one or more features described above in one embodiment or example can be equally applied to another embodiment or example described above. The features of one or more embodiments or examples described above can be combined into each of the embodiments or examples described above. Any full or partial combination of one or more embodiment or examples of the invention is also part of the invention.

As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. A mobile terminal comprising:

a wireless communication unit configured to wirelessly communicate with at least one other terminal;

a touchscreen;

a memory configured to store an application, an application icon relating to the application, and a widget relating to the application; and

a controller configured to:

control the touchscreen to display the application icon, execute the application in response to a first touch gesture on the application icon, the application being configured to display content items when executed, reduce a size of an application screen of the executed application in response to a first pinching-in input operation performed on the application screen, determine if the application screen is reduced below a predetermined size,

control the touchscreen to display the widget corresponding to the application instead of the application screen when the application screen is reduced below the predetermined size,

control the touchscreen to display the application icon corresponding to the application, instead of the widget, in response to a second pinching-in input operation performed on the widget,

display the widget in response to a second touch gesture on the application icon, the widget being configured to display part of the content items of the application, the displayed part of the content items on the widget being different from information displayed on the application icon, and

execute the application in response to a third touch gesture on the widget,

wherein a first indicator is configured to be displayed on a corner of the application icon, and a second indicator is configured to be displayed on a corner of the widget, and

wherein the second indicator has the same shape as the first indicator and comprises a circular image.

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2. The mobile terminal of claim 1, wherein the controller is further configured to control the touchscreen to change the displayed part of the content items on the widget when the widget is displayed.

3. The mobile terminal of claim 2, wherein the controller is further configured to control the touchscreen to change the displayed part of the content items in a slide mode.

4. The mobile terminal of claim 1, wherein the application is a gallery application.

5. The mobile terminal of claim 1, wherein the first touch gesture is a tapping gesture operation on the application icon,

wherein the second touch gesture is a pinching-out input operation on the application icon, and

wherein the third touch gesture is a pinching out input operation on the widget.

6. The mobile terminal of claim 1, wherein when the executed application includes a video file, the controller is further configured to temporarily stop a playback of the video file when the widget is displayed instead of the application.

7. The mobile terminal of claim 6, wherein the controller is further configured to detect a pinching-out input operation on the widget corresponding to the playback of the video file, and to display a video player screen and resume the playback of the video file on the video screen player in response to the detected pinching-out input operation.

8. The mobile terminal of claim 1, wherein the controller is further configured to:

determine whether there is a first type of touch gesture or a second type of touch gesture on the application icon, the first type of touch gesture being different from the second type of touch gesture,

in response to determining that there is the first type of touch gesture on the application icon, execute the application, and

in response to determining that there is the second type of touch gesture on the application icon, alternatively display the widget.

9. The mobile terminal of claim 1, wherein the application is an email application displaying email contents, the widget displays selected ones of the email contents and a number of new emails, and the application icon displays the number of new emails.

10. The mobile terminal of claim 1, wherein the application icon displays a notification relating to the content items overlaid thereon.

11. The mobile terminal of claim 1, wherein the controller is further configured to rearrange other display objects displayed on the touchscreen when the widget is changed into the application icon.

12. The mobile terminal of claim 1, wherein the controller is further configured to periodically update at least part of the content items of the application displayed on the widget.

13. A method of controlling a mobile terminal, the method comprising:

allowing, via a wireless communication unit on the mobile terminal, wireless communication with at least one other terminal;

displaying, on a touchscreen of the mobile terminal, an application icon relating to an application;

executing, via a controller on the mobile terminal, the application in response to a first touch gesture on the application icon, the application being configured to display content items when executed;

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reducing a size of an application screen of the executed application in response to a first pinching-in input operation performed on the application screen;  
determining if the application screen is reduced below a predetermined size;  
5 displaying, on the touchscreen, a widget corresponding to the application instead of the application screen when the application screen is reduced below the predetermined size;  
10 displaying, on the touchscreen, the application icon corresponding to the application, instead of the widget, in response to a second pinching-in input operation performed on the widget;  
15 displaying the widget in response to a second touch gesture on the application icon, the widget being configured to display part of the content items of the application, the displayed part of the content items on the widget being different from information displayed on the application icon; and  
20 executing the application in response to a third touch gesture on the widget,  
wherein a first indicator is configured to be displayed on a corner of the application icon, and a second indicator is configured to be displayed on a corner of the widget, and  
25 wherein the second indicator has the same shape as the first indicator and comprises a circular image.

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14. The method of claim 13, further comprising changing the displayed part of the content items in a slide mode.  
15. The method of claim 13, further comprising:  
displaying information corresponding to execution of the application in the application icon; and  
aligning the application icon with other icons being displayed in response to the second pinching-in input operation.  
16. The method of claim 13, further comprising:  
expanding, via the controller, the application screen back to its original size before the first pinching-in input operation has been performed when the application screen is not reduced below the predetermined size.  
17. The method of claim 13, wherein the first touch gesture is a tapping input operation on the application icon, wherein the second touch gesture is a pinching-out input operation on the application icon, and wherein the third touch gesture is a pinching out input operation on the widget.  
18. The method of claim 13, further comprising rearranging other display objects displayed on the touchscreen when the widget is changed into the application icon.  
19. The method of claim 13, further comprising periodically updating at least part of the content items of the application displayed on the widget.

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